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Wiegmans, B.W.; Bruinsma, F.R.

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The challenges of combined transport in an integrating European economy: A case study for international firms

Bart Wiegmans
Frank Bruinsma

Research Memorandum 1999-28

vrije Universiteit amsterdam

Abstract

In this paper, we deal with the challenges offered to international firms by combined transport. We start with an introduction to logistics and marketing channels. An attempt is made to link the current theory about marketing channels to combined transport and logistics in order to develop a customer-based and broadly applicable approach to the study of freight transport in Europe. Furthermore, we researched the critical success factors of combined freight networks in relation to international firms. A framework has been developed in order to structure the opportunities that intermodal transport offer to support the activities of international firms. Subsequently, an overview is given of the development of international trade with emphasis on the European Union, and in particular, The Netherlands. The actual freight flows generated by a sample of recently international relocated firms are included in a survey. A second survey has been conducted among the same companies in order to examine the opportunities of combined transport in relation to international firms and their freight flows. The paper closes with conclusions and recommendations for further research.

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1. Introduction

The increasing interest in combined transport as an alternative to unimodal road transport has heightened the need for research in this field. In the combined transport chain a central position is claimed by the intermodal freight terminal that transhipsfreight between truck, rail, ship and/or barge. Over the centuries there have been many examples of a structural change in the relative importance of transport modes (Nijkamp et. al., 1994). For example, in the Hanseatic period (thirteenth to sixteenth century) barges and coastal freight transport emerged as new logistic systems. In this period centrally located cities near the big rivers in the North of Germany and the North-east of The Netherlands co-operated in trading and shipping. The Golden Age (the seventeenth century in The Netherlands) can be characterised by a drastic growth in deep-sea freight transport caused by colonisation. During the Industrial period (from about the middle of the eighteenth century until 1945) railways emerged as a new transport mode facilitating the development of mass production. After 1945 the period of internationalisation dawned, marked by an unprecedented increase in freight transport by road at the expense of railways, as a result of a clear customer focus. From the beginning of the twenty-first century we may expect to see an increase in combined transport, making an optimal use of existing transport networks, and facilitated by the great many possibilities offered by the Information period (1990 and beyond). As a result, we have seen the emergence of several new modes, but the synergy between these modes has never been exploited fully.

The use of combined transport (including rail, short-sea, and barge) seems to offer advantages over unimodal road transport. The increasing congestion on European roads strengthens the position of combined transport, which may be further strengthened by own quality improvements (due to an increase in the quality and/or quantity of services and/or a decrease in the costs of services). Improvement of the quality of combined transport requires a severe organised and well managed logistic channel. Increased usage of Information and Telecommunication Technology (ICT) probably will lead to a better quality of the logistic channel and thus of combined transport (e.g. more accurate order status information). Availability of combined transport may further improve, caused by an increase in market share that - due to more volume - enables more frequent combined transport services. These more frequent services will, in turn, facilitate more efficient rush services. Overall, it seems obvious that - in certain situations combined transport offers opportunities over unimodal transport solutions.

A theoretical framework is required to investigate the potential of combined transport - including the use of freight terminals - for international firms. An international firm is defined as a firm that is incorporated in an international network of firms, producing for the international market and generating international flows of freight and/or information (see, for example, Bruinsma et al., 1998). International operating firms – defined like this – seem to be a target group that could optimally exploit the opportunities offered by combined transport.

If we extend these opportunities to international firms we come to the following research objective: *What challenges do combined transport including the use of freight terminals offer to international firms?*

The advantages international firms are offered by combined transport, strongly depend on the organisation of the logistic channels of international firms. In recent years we have seen the following developments in logistics and related matters within international firms:

I) efficiency improvements of individual logistical operations are useless if they throw the total system out of balance;

II) logistics have become an important competitive tool;

III) logistics are no longer a part of business where costs are minimised, but instead are seen as an important strategic activity;

IV) logistics are often outsourced activities in cases where international firms restrict themselves to their core business.

Especially these developments may lead to an increased usage of combined transport by international firms. The logistic channel has become a competitive tool among international firms which might be forced to take the initiative, since logistics are one of the remaining cost factors that they can use to compete with (this also holds true for labour costs). However, the logistic cost structure is very complex: logistic costs consist of numerous components such as transportation, warehousing, terminal handling, inventory management, transport management and administration. Moreover, logistics do not belong to the core activities of international operating firms. Therefore, it might be interesting for international operating firms to outsource their logistic activities when a specialised intermediary can provide this service at a better price/quality ratio. Thus, this complex cost structure may lead to two contrasting strategies by international firms. An international firm might either try to reduce its logistic costs by further internalising the logistic chain, or otherwise might externalise the costs by outsourcing the logistic chain to a specialised intermediary.

For international firms, the individual advantages of combined transport are not limited to cost reductions. One might also think of advantages such as: a more environmentally friendly perception of the international firm, stable and reliable long-term relationships in combined transport operations and risk reduction through information-sharing in the combined transport channel.

In section 2, we will discuss the principles of the marketing channel with an emphasis on logistics and the role of combined transport. In section 3, we will highlight the strategic position terminal operators might fulfil as intermediaries in the marketing channels in which combined transport plays an essential role. In section 4, the mutual advantages of a close co-operation between international firms and combined transport is brought to the fore. This section results in a framework that analyses the opportunities, which exist between the two. In section 5, we start our empirical presentation by giving an overview of the development of international trade and investment flows with an emphasis on intra-European trade patterns. The actual freight flows are researched on the basis of their potential use of combined transport instead of the currently implemented uni-modal road transport. In section 6, the framework – as structured in section 4 - is confronted with the actual freight flows generated by a small sample of recently international relocated firms.

2 Marketing channels and combined transport

In this section we will introduce the marketing channel analysis as a useful framework for investigating combined transport and freight terminal operations. A marketing channel is a ***superorganisation*** comprising interdependent institutions and actors involved in the task of making products and services available for consumption by end-users. However, a marketing channel starts with customer needs, and ends with customer satisfaction. Each channel begins with customer needs: the incentives for producers to start producing and thus generating freight flows to the producing company. Following the production process, the products are transported to wholesalers who distribute the products to retailers. Finally, products are bought by customers and (hopefully) this results in customer satisfaction. It is assumed that customer needs are the basic determinants of all marketing channel movements, including the freight transport flows. Production is then also based on the needs of people, followed in the end by consumption, which results in customer satisfaction (Takada and Kobayakawa, 1998 and Inamura et. al., 1997). It seems even plausible to assume that all marketing channels and transport networks are customer driven. The reflecting patterns of freight, payment, and other

marketing channel flows are subject to permanent change and adjustment (see Figure 1). This suggests that incidental and more trend-wise changes may occur in networks -including terminals - that facilitate the flows of goods and services (Priemus et. al., 1994). This customer-oriented approach implies that marketing channels and networks should optimally and flexibly serve the customer.

Generally, numerous actors are involved in the marketing channel from customer need to customer satisfaction. In such channels all sorts of marketing channel flows are running between the different actors in the channel. In Figure 1 we selected two marketing channel actors and the main channel flows between them. This figure also clarifies the links to the logistic approach; the management of the flow of materials, products and corresponding information from source to customer.

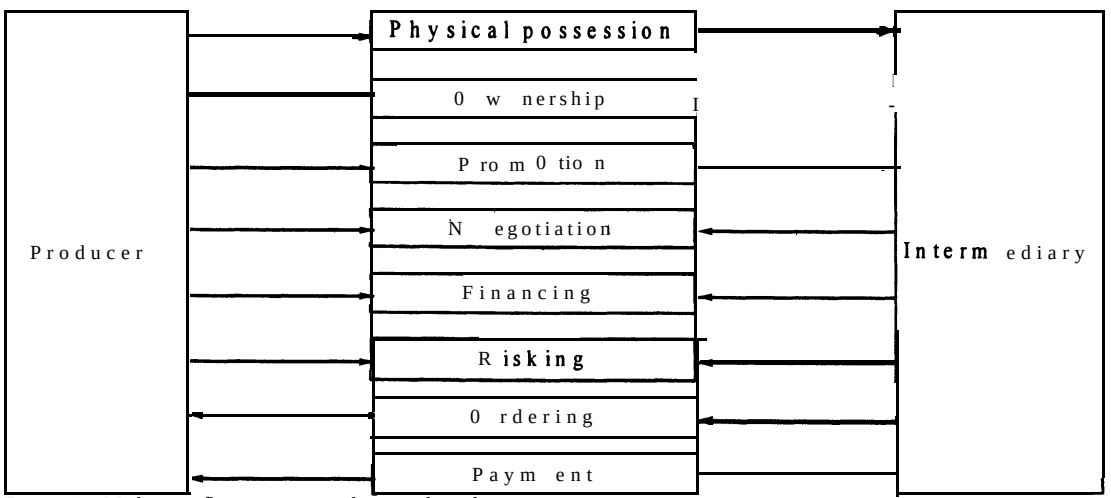

Figure 1. Marketing flows in a marketing channel
(Source: Stern, 1996)

Logistics are defined as "managing the flow and storage of raw materials, work-in process, finished goods and the associated information from the point of origin to the point of final consumption in accordance with customer needs". Logistics can be divided into two separate functions; collection logistics and distribution logistics. Materials management (collection logistics) includes inbound transportation and inventory management for producing companies. The emphasis in this process is on raw materials, finished or semi-finished goods, and company internal services. Distribution logistics encompass the outgoing product flows from firms to customers through a network of transportation links, storage, distribution and handling nodes. It will be clear that both types of logistics ask for a different dedicated approach. Given the complex structure of both collection and distribution logistics they seem to offer good opportunities for combined transport.

Physical distribution and logistics have become more important to international firms. Among others, the effects for international companies are seen in the following general developments: (1) managers have realised that improving the efficiency of individual logistical operations is useless if the efficiency of the individual function throws the total system out of balance; (2) the logistics system has become an important competitive tool; (3) many of the technological developments over the past 20 years have been system-oriented, which emphasises the logistics system as a whole; and (4) logistics are no longer a part of business where costs are minimised, but instead are seen as an important strategic activity.

Marketing channels cover more than the management of physical flows of goods and the associated information as covered by the definition of logistics. A marketing channel structure is a combination of a set of institutions, actors and establishments through which a product or service must move to reach the industrial users or the final consumers (see Figure 1). Usually, several actors join forces in complex channel arrangements. The channel should

be viewed as a network that creates value for end-users by generating form, possession, place and time utilities (Magee et. al., 1985). In general, physical possession, ownership and promotion are typically flows that are aimed in a forward direction from producer via intermediaries (wholesaler/retailer) to consumers. Negotiation, financing, and risking flows move in both directions. Risking has to do with profit opportunities that are realised by taking risks. Ordering and payment flows are aimed in a backward direction. With financing flows we mean transfers of ownership which induce inventory holding costs.

Communication between combined transport marketing channel members is an important prerequisite for a successful implementation of combined transport. In addition, a situation of many actors in a channel all striving individually for maximum profit may prevent a profitable and flexible functioning of the marketing channel as a whole. Up until now many relations in combined transport channels in EU countries are based on a competitive model in which many actors are involved without seeking co-operation. For example, terminal users generally perceive terminal services to be inadequate, whereas terminal operators are mainly interested in filling capacity and/or minimising costs.

International operating firms may play an important role in facilitating an increase in the use of combined transport including the use of freight terminals. These international firms may initiate the following developments:

- wherever justifiable, transport is done by barge, coastal shipping or train. International firms may deliberately choose combined transport;
- striving for a joint reduction in channel inventories. More reliable combined transport solutions enable a reduction in channel inventories;
- striving for channel-wide cost efficiencies. International firms may realise and share cost reductions by using combined transport on a more regular basis;
- having a long time horizon. This long term orientation enables the development of more stable relations between channel actors ;
- sharing information required for planning and monitoring processes. Even confidential information is shared with a small number of combined transport actors;
- having multiple contacts on inter-firm and channel level. Co-ordination of all channel operations is necessary;
- having a small supplier base to increase co-ordination. International firms are expected to decrease their number of combined transport contracts. This means higher volumes per contract and thus more opportunities for combined transport;
- sharing long-term risks and rewards. Sharing of risks and rewards by international firms will increase trust in the combined transport channel;
- ensuring that flows are interconnected throughout the channel. This will hopefully lead to a speed up in combined transport channel time.

If international firms increase their use of combined transport, they may expect the following advantages:

1. the company may be positioned as environment friendly, due to the use of environmentally friendly transport modes such as barges, coastal ships or trains;
2. it may be cheaper and more reliable to use marketing channels oriented on well-managed and co-ordinated combined transport (e.g. lower administration costs);
3. if combined transport is used less storage space may be needed, because storage of goods is possible within the transportation phases of the marketing channel.

3. The unique position of intermodal freight terminal operators in combined transport

In the logistic solutions a special position is claimed by combined transport. Combined transport is transport of freight using two or more transport modes, where at least the main transport link is served by rail, barge or coastal transport. Especially for combined transport

solutions the logistical quality depends on the strength of the weakest link or terminal. The average perception by international firms of combined transport is low. A stronger position of combined transport will have to come from a strengthening of its own solutions and not from a weaker position of its main competitor: unimodal road transport.

Transport carriers and terminal operators occupy unique positions in combined transport marketing channels, because they have the advantage of being neutral towards initial customer needs. This implies that logistics companies may take a broader perspective on marketing channel problems than the producing international firms. In general, combined transport channels comprise more actors, which suggest a longer and more complicated channel while profits need to be shared with more actors. International firms have an important task here, because they provide usually large - international - freight flows suitable for combined transport. Integration of combined transport operations may deliver: scale economies, economies from combined operations, benefits from information (reduction in uncertainty), stable relationships, access and adoption of technology, supply and/or demand stability, and cost advantages (reduced transaction costs).

Combined transport is characterised by the use of at least two transport modes in an integrated manner in a door-to-door marketing channel (logistical solution). This type of transport may be the ideal mode for carrying freight in order to reduce total channel costs, pollution, road congestion and noise levels. For the combined transport companies the first most important task is to provide the best possible customer-oriented combined transport service for a well balanced price/quality ratio to the international firms. The primary combined transport objective is to assist in revenue generation for the international firms, by providing the strategically desired customer service at the lowest total marketing channel cost. This implies that the desired customer service level by international firms decides what the lowest marketing channel cost level is.

Much of the current research on freight transport is based on a comparison between different transport modes and their related (dis)advantages (Bithas and Nijkamp, 1996 and Jourquin, 1997). However, this approach presents a problem in the sense that it fails to take into account the synergetic spectrum offered by combined transport solutions provided by transport carriers and terminal operators. A simplification of the traditional unimodal approach is shown in Figure 2. The lines in Figure 2 represent freight flows. In this example, each marketing channel member (6) has numerous contacts (3) throughout the channel with all sorts of transport actors.

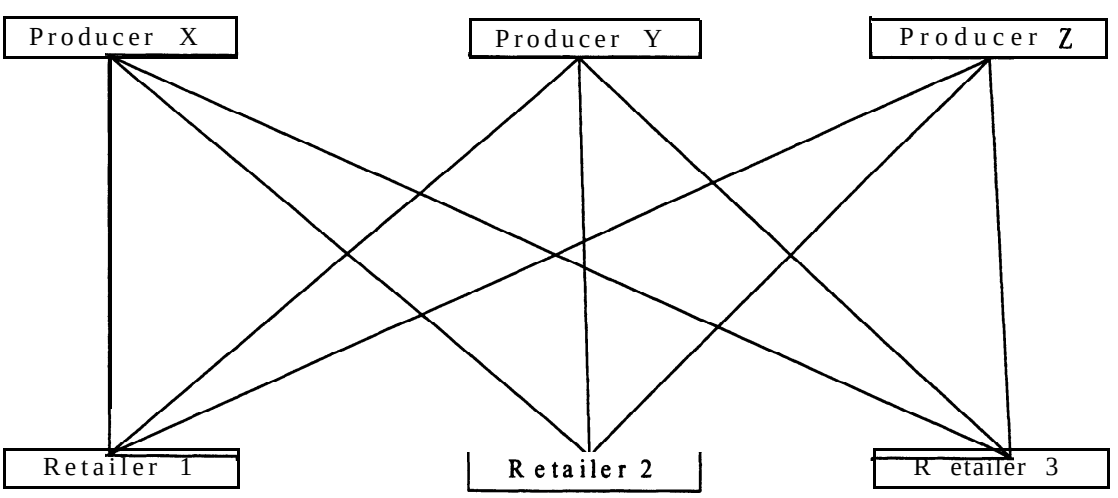

Figure 2. Independent freight flows between all channel members

The differences between the various combined transport solutions need to be analysed more thoroughly so as to provide insight in the full potential that is offered by combined transport services. The current common European Transport Policy (CETP) encourages combined freight transport, because it supports the main policy objectives: an encouragement of less favoured regions through the supply of European linkage infrastructure, a rise in economic efficiency of the transport market through more deregulation, and liberalisation and the fulfilment of sustainability in the transport sector. Combined transport tries to merge services of distinct transport carrier types to improve overall physical distribution performance of freight movements, thereby achieving environmentally friendly and less costly solutions and wider access to product markets and supply sources.

When using combined transport, efficient and co-ordinated use of transport networks is very important (Capello and Nijkamp, 1993). According to Stem and El-Ansary (1996), a decentralised transport system is less efficient than a centralised network that uses transport intermediaries (e.g. carriers or terminal operators). These transport intermediaries can considerably reduce the number of transactions and thus costs (Raesfeld-Meijer, 1997). Other advantages are minimisation of assortment discrepancies, establishing of routines, and facilitation of search procedures. The position of intermediaries and other marketing channel members is illustrated in Figure 3. According to Magee et. al., (1985) and van Klink (1995) intermediaries increase the efficiency of the flow of goods by creating utility elements of place, possession, time, and form.

The intermediary in the combined transport marketing channel could very well be an *intermodal freight terminal operator*. In general however, most terminal operators work with outdated equipment and are only interested in filling capacity and/or minimising costs.

In contrast, a *carrier* as intermediary has the important advantage of a better understanding of customer needs. Still, transport solutions offered are usually restricted to one transport mode; there is only one option offered (no alternatives), thus fewer opportunities for accumulating freight flows are available.

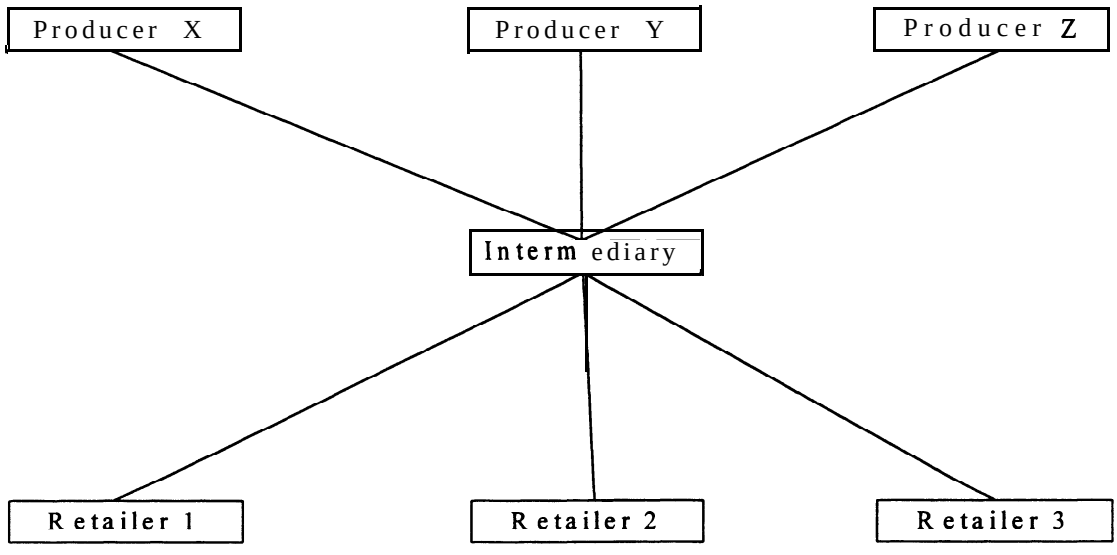

Figure 3. Linked physical transport channels between producers and an intermediary and between retailers and the intermediary (seven actor, 6 transactions)

If the introduction of an intermediary (which requires co-operation) leads to lower overall costs for marketing channel transactions, it could be done successfully. Advantages of strategic channel co-operation are cost spreading, cost reduction, risk reduction (higher reliability), time reduction, lower stocks, scale effects, synergy, competition reduction, opportunities to specialise, and increased flexibility and access to markets. However,

disadvantages of strategic co-operation are cultural differences, reduction in freedom, time consuming procedures, communication problems, profits division, and manageability. Currently, in combined transport operations, the disadvantages outweigh the advantages, which results in marketing channels that do not function as efficiently as they could.

Physical transport operations are usually derived demand, whereas terminal operations are second order derived demand. This may imply that channel actors in combined transport are generally not involved in many marketing channel flow functions. Carriers and terminal operators have physical possession which creates possession utility, as they are transporting or handling freight. Payment flows run, in principle, from customers (e.g. carrier) towards terminal operators. Communication, negotiation, process, risking, and people are all flows that run both ways in transport marketing channels. In this respect, time utility is created by process and communication flows. The product or service flow runs from terminal operator towards a carrier and represents the delivered service (e.g. transhipment) by the terminal operator. This service delivered by the terminal operator creates place utility. If terminal employees perform their jobs well, they may create form/function utility. Terminals are used either out of necessity (change of transport mode) or because solutions including the use of a terminal offers more quality, better time performance, and/or lower total channel costs. Combining terminal customers and freight flows results in the following matrix.

Freight Flows	Terminal Customers: Paying	Terminal Customers: Non-paying
Incoming	Shipping companies	Transport carriers
Outgoing	Intermediaries	Transport carriers

Figure 4. Terminal operator; customers and freight flows.

The matrix in Figure 4 distinguishes between paying and non-paying customers. Especially the shipping companies are important for the terminal operator as the main source of revenues and freight flows. Non-paying customers are concentrated among the transport carriers. If we concentrate on the incoming freight flows, we observe that they are mainly provided by large shipping companies. Shipping companies are deep-sea shipping lines that mainly transport containers on a global scale. This matrix is constructed in order to provide insight into the different types of freight flows that are provided by international firms and to highlight the central position that the terminal operator has in combined transport operations.

Not all terminal customers will have the same contacts with the terminal operator. These contact points then represent the different flows that run between operator and customer, and it may give some indications for the creation of utility. Generally, terminals are not perceived as a chance to facilitate a more efficient operation of marketing channels. But terminal operators may very well be organisers (intermediaries) of marketing channels.

To summarise: from a theoretical and practical perspective, the terminal operator may be the most attractive marketing channel member to become an intermediary in the combined transport marketing channel. However, until now the scope of terminal operators is focused on filling of terminal capacity and minimisation of terminal costs, whereas a combined transport marketing channel intermediary demands a wider scope on efficiency of the whole marketing channel and trust from all other channel members.

4. International firms and combined transport: the mutual advantages and disadvantages

In this section we introduce a framework to structure the relation between international firms and combined transport. We defined an international firm as a firm that is incorporated in an international network of firms, produces for the international market and generates international flows of freight and/or information. Basically, the international firm has two options to handle the international flows of information and freight. The international firm can internalise the logistics chain into its other business operations or the firm can choose to outsource the complete logistics chain to a specialised company. Especially large international firms may generate high volume freight flows that seem suitable for combined transport. Combined transport is characterised by the use of at least two transport modes in an integrated manner in a door-to-door marketing channel (logistics solution). The special relation between international firms and combined transport is de&ted in Figure 5.

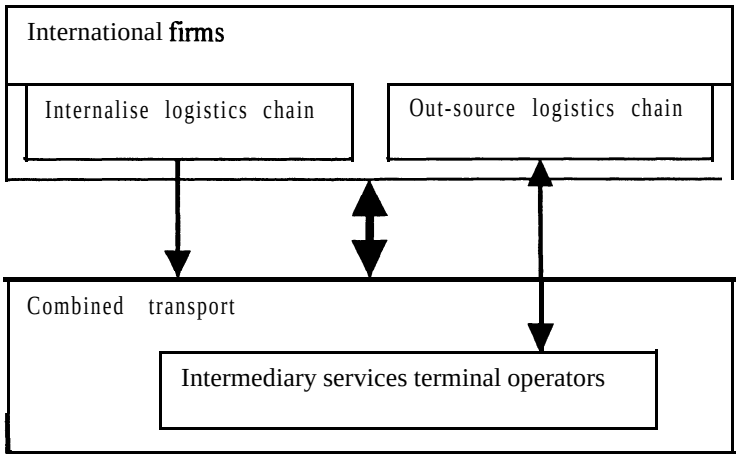

Figure 5: Relations between international firms and combined transport

There are five links of interest in this framework expressing the mutual relationship between combined transport and international firms. These links are:

1. advantages and disadvantages of combined transport for international firms;
2. advantages and disadvantages of the flow of goods from international firms for combined transport;
3. additional advantages and disadvantages of combined transport for international firms that internalise the logistic chain;
4. additional advantages and disadvantages of terminal operators serving as intermediaries in combined transport chains for international firms that outsource their logistic activities;
5. additional advantages and disadvantages of outsourced good flows from international firms for terminal operators serving as intermediaries in combined transport chains.

We first focus on the general relation between combined transport and international firms. Currently, most international firms transport their freight by road, leading to a market share for this transport mode of around 80 per cent of the transported volume. International firms are expected to realise the following advantages when using combined transport:

- the storage of goods may take place in the transportation phases (in containers) leading to lower safety stocks;
- the international firm may achieve an environmental friendly image;
- the increasing congestion on European roads can be bypassed;

- the relatively large freight volumes that are offered by these international firms enables an increase in frequencies and a better price.

However, a number of points can be raised that are not in favour of the potential use of combined transport by international firms. In the first place, accessibility by rail, barge or sea is given low priority by international firms. Secondly, the service of freight has a low priority by most national railway companies. Thirdly, compared to uni-modal transport combined transport has the disadvantage of at least one transhipment within the logistic chain. Finally, internal classified information may be required for combined transport companies to function more properly. This information has to be provided by international firms that are usually not willing to give this type of information.

The internalisation of the logistics chain into the other business activities of the international firms is compared with the outsourcing of the logistics chain. Both lead to additional advantages and disadvantages for the use of combined transport by international firms. International firms that *internalise* the logistic chain may have some advantages including a better control of company logistics operations, and more control over the use of logistics as a competitive tool in the business portfolio. However, the internalisation may lead to many channel actors all individually striving for minimum transport costs. Furthermore, international firms that internalise the logistics chain have a less broad view on transport networks than specialised combined transport companies, and a decentralised transport network is less efficient than a centralised network. To keep a span of control on the logistics chain requires sophisticated administrative handling.

International firms that outsource the logistics chain may have the following advantages:

- international firms can concentrate on their core business;
- decrease in logistics costs because of the better knowledge of the combined transport company (transportation, storage and administration);
- specialised combined transport companies are more and better oriented towards an efficient and effective use of transport networks;
- higher volumes and more stable relationships enable combined transport companies to invest in technological developments;
- outsourcing leads to a smaller supplier base which may lead to a better co-ordinated combined transport solution;
- rise in economic efficiency;
- opportunities to specialise for both the international firms and the combined transport operators.

In recent years, combined transport has become a major issue in European policy-making. The main goal is to increase its market share at the expense of uni-modal road transport. Besides policy measures, there is an enormous challenge for combined transport companies to increase the price/quality ratio of their services. For international operating firms, combined transport may offer particular advantages:

- combined transport actors join forces in long term contracts;
- constant flow of goods (reliable and regular);
- when using combined transport the synergies between different transport modes can be fully exploited;
- the price/quality of combined transport is improving (especially if barge transport plays a role);
- combined transport is relatively more competitive on longer distances, which is precisely the type of freight flow international firms offer for transport;
- a strategic orientation towards combined transport may enable cost reductions;
- sharing of risks and rewards installs trust in the combined transport marketing channel;
- transport is no longer seen as an area where costs should be minimised but as a strategic logistics marketing channel activity;

- better co-ordination may lead to a reduction in uncertainty;

However, given the current state of combined transport, there still are a number of disadvantages (which might be reduced or even solved) of the use of combined transport for international firms. For example:

- the management (e.g. many actors) of combined transport solutions usually complicates daily operations;
- combined transport is generally perceived as more time consuming than uni-modal road transport;
- cultural differences may complicate combined transport operations;
- the necessary co-ordination for combined transport is often time-consuming and reduces the freedom of the individual actors;
- communication problems may arise (e.g. different ICT-systems);
- division of profits may lead to conflict.

One way of increasing overall price/quality of combined transport may be terminal operators that act as intermediaries in the logistic chain. A terminal operator, as an intermediary in the combined transport channel, has the advantage that:

- he may reduce the number of transactions considerably;
- freight terminals may facilitate search procedures for combined transport solutions;
- terminal operations are second order in derived demand and therefore pose no direct threat to international firms or to transport carriers;
- the freight terminal is the place where much freight changes physically in means of transport.

In section 6, we will further investigate the willingness of international firms to use combined transport – internally or outsourced – in their logistics chain (links 1, 3 and 4 of the framework). However, before analysing the demand of international firms for combined transport and for the services of intermediaries, we will illustrate that intra-European goods flows are growing at a faster rate than intercontinental goods flows. In this era of globalisation, the impact of the unification of the European market and the opening of the Eastern European markets have received less attention than they deserve. These developments generate huge opportunities for combined transport and for the flow of international goods.

5. Analysis of trade flows

In this section, we will present some macro-economic trade figures related to Europe in general and The Netherlands in particular in order to examine whether the international flow of goods can make use of inter-modal transport. The opportunities of freight terminals shows up clearly in this small open economy.

Since the 13th century, international trade in north west Europe grew in importance. In the Hanseatic period trade developed between Dutch and German cities situated along the rivers and the Scandinavian and Baltic coasts. In the Golden Age trade between Europe and the colonies in the Far East, Africa and the America's flourished. The Industrial Revolution led to a rapid increase in the development of the trade pattern between European countries. The iron and steel industry stimulated the development of inland transport: rail became the main transport mode for people and goods. The railways opened up the European hinterland which before was inaccessible via traditional transport and inland waterways. The First and Second World War and the world-wide economic recession of the 1930's led to a rapid decrease in international trade. Since 1950 international trade is recovering, and recently terms such as internationalisation, globalisation and global economy have become common. On the other hand, the level of world trade – measured as a share of gross domestic product – is still not at the pre-war level (Table 1).

Table l-Export and import flows as a percentage of the GDP.

	1913	1950	1973	1994	1994
France	30.9	21.4	29.2	34.2	
Germany	36.1	20.1	35.3	39.3	
United Kingdom	47.2	37.1	37.6	41.8	
The Netherlands	60.0	70.9	74.8	89.2	
United States	11.2	6.9	10.8	17.8	
Japan	30.1	16.4	18.2	14.6	
Average	42.6	28.8	34.3	39.5	

Source: Ruigrok & Van Tulder, 1995

Table 2-Trade between EU countries and EU – non-E&countries measured as share in GDP

	Export between EU-countries	Export with non-EU-countries
1960	6.6	8.7
1965	8.0	6.1
1970	9.9	6.8
1975	11.6	8.2
1980	13.4	8.5
1985	15.1	10.0
1990	14.7	7.5
1995	14.4	8.6

Source: European Commission, 1996

With the passing of time, the use of transport modes has changed. Vessels are still the most important transport mode for intercontinental good flows, whereas spare parts, high value goods and knowledge (people) are commonly transported by air. Railways became the dominant transport mode for land transport, and inland watenvays are still used for bulk and the rapidly growing containerised transport. The role of railways in inland freight transport continues to diminish. However, both railways and inland waterways are increasingly part of the logistics chain of combined freight networks in particular of containerised goods. Another difference is the shift in the direction of transport flows. Trade between members of the European Union has increased whereas the trade between European Union members and non-European Union countries – in particular Third world countries – stagnated during the last decades (see Table 2). In other words, the increasing foreign trade among European Union members is concentrated on the internal European market. Although one could speak of a growing internationalisation of the national economies within Europe, this internationalisation is the driving force behind European integration. The European Union appears no longer to be integrating further into the global economy. The increasing concentration of intra-European trade and freight flows is a first sign of the market potential of combined freight transport, intermodal networks and freight terminals. However, until now almost all growth in the transport sector has been absorbed by unimodal road transport.

Seen from a macro-economic perspective, import and export relations (expressed in terms of the value of traded goods), appear to show a rather steady increase between West-European countries and The Netherlands over recent decades (see Table 3). Clearly, these figures do not immediately lead to the conclusion that more attention should be paid to road, railway, and inland waterway networks and less to the Dutch mainports of Rotterdam and Schiphol, since the difference between volume and value is at stake here. The trade with West-European countries mainly concerns high-value consumer products and intra-industry trade, whereas trade with developing countries in particular is related to low-value raw materials. The value of the trade does not tell much about the volume of the transport flows. Nevertheless, the trend is clear: the annual value of the Dutch international trade flows has increased from 175 billion to nearly 600 billion Dutch guilders over the period 1975- 1995. Admittedly, these figures are shown in current prices, but also the rise in trade in fixed prices (i.e. corrected for inflation) still remains considerable. In conclusion, these figures suggest a growing international, in particular European, orientation of the Dutch economy. This ongoing growth in

intra-European trade flows offers opportunities for the further expansion of combined transport in Europe. For The Netherlands – as one of the gateways to Europe – there are major opportunities for achieving a strong position in the European combined transport market given the presence of dense inland waterway and rail networks and good short-sea connections, south towards the Mediterranean and north towards the Baltic countries.

Table 3-Import and export of goods of The Netherlands (as a share of the total value of The Netherlands)

	West-Europe	East-Europe	North-America	Latin-America	south America	Australia Asia	Oceania
1975	72.1	2.3	4.4	7.1	2.8	10.9	0.5
1977	71.3	2.1	4.9	6.7	2.6	12.0	0.4
1979	72.9	2.3	4.9	6.3	2.6	10.6	0.4
1981	70.4	3.0	4.9	6.9	2.7	11.7	0.4
1983	71.9	3.5	5.1	7.2	2.5	9.4	0.5
1985	73.5	3.0	4.2	7.3	2.7	8.7	0.5
1987	77.3	1.9	3.0	6.4	1.9	9.0	0.5
1989	76.9	2.0	2.6	7.2	1.9	8.9	0.5
1991	78.2	1.7	2.4	6.3	1.7	9.3	0.4
1993	75.4	2.4	2.1	6.4	2.1	11.1	0.4
1995	77.0	2.6	1.8	6.0	2.1	10.1	0.3

Source: Bruinsma et al., (1997)

Furthermore, it should be noted that import and export flows are only partial indicators for globalisation phenomena (see also Kleinknecht and ter Wengel, 1998). Given the importance of the marketing channel – as stated in section 2 -, in addition to exports and imports, it is also necessary to pay attention to international capital and communication flows. The development of the international inward and outward capital flows - foreign direct investments - shows for The Netherlands to a large extent the same pattern in volume growth and spatial direction as described above for the trade flows (Bruinsma et al., 1997). The flow of foreign direct investments towards low-wage countries (for instance, developing countries) is relatively small and increasing at a low growth rate. Seen from the viewpoint of the structural and substantial export surpluses, it is no surprise that The Netherlands is a net exporter of capital.

In summarising, many empirical facts demonstrate that the share in trade and capital flows between The Netherlands and other European countries is by far the largest and is still increasing at a fast rate. This growing importance of intra-European freight flows offers a challenge and opportunities for combined transport. As some of the key actors in combined transport, intermodal terminal operators are challenged to strengthen their position within the marketing channel by becoming the intermediaries who organise and manage the logistics chain of international operating firms.

It is noteworthy that there are no clear indications of a dramatic orientation of the Dutch economy towards the American or Asian markets. Inspired by the ideas of globalisation, many recent research efforts on international firm relocations have focused attention on the presence of American, Japanese and Korean companies in The Netherlands. Our findings suggest, however, that – given the volume and growth of intra-European freight flows - it is more meaningful to address the relocation patterns of firms at an intra-European level rather than at a global level outside of Europe. Therefore, in the next section we will pay particular attention to the intra-European relocation behaviour of multi-plant firms. These firms generate international good flows that potentially can be transported by inter-modal transport chains.

6. Freight flows generated by international firms

To reach a better understanding of the abilities of combined transport in order to cope with the demand for transport by freight generating firms, it is necessary to investigate more thoroughly the determinants of the freight generation of firms fi-om a micro perspective. This is the subject of this present section, in which the freight flows, and the direction of the flows of recently international relocated firms are researched. In our case study Japanese and American companies in The Netherlands and Dutch firms in Poland are surveyed. By using a structured questionnaire and additional interviews, a wealth of relevant systematic information could be collected on cross-border transport flows and the related infrastructure demands of these firms. The following distribution of international relocated firms has been deployed for our empirical analysis (see Table 4).

Table 4-List of interviewed firms

Foreign companies in The Netherlands
4 North-American distribution companies
1 North-American service company
1 North-American production company
4 Japanese distribution companies
1 Japanese production and distribution company
1 Japanese R&D company
Dutch companies in Poland
3 distribution companies in Poland
2 transport companies in Poland
1 service-company in Poland
1 production company in Poland

Source: Bruinsma et al., 1997

The foreign firms in The Netherlands have been selected from the general business register of the Chambers of Commerce in The Netherlands. The Dutch firms in Poland are selected from the register of the Dutch Embassy in Poland. All selected companies were characterised by a recent relocation (after 1990). Clearly, the sample does not cover the whole population of freight generating firms, but represents important American and Japanese firms and Dutch firms moving to East-Europe. The foreign companies in The Netherlands are eight distribution companies and one service-firm located in the central urban area (Randstad) plus two production firms and one R&D company located in the vicinity of the Randstad. The Dutch firms in Poland were selected on the grounds that this country recently is regarded as a new springboard for Central and East-Europe. All the Dutch companies which were interviewed are located in the Warsaw urban area, the major hub in Poland. Most interviewed firms in Poland were either distribution or transport companies. We must admit that production firms are **under-**represented in this selection. This will have implications for the accuracy of the results of the opportunities that we find for combined transport for the raw materials and semi-finished goods categories. However, as distribution firms are well represented, we may achieve a clear picture of the opportunities for combined transport with regard to consumer goods.

The following items were specifically addressed: general company characteristics, the company network structure, location motives, development of transport flows (inward and out-ward), and the infrastructure use and demand by the company. In the case study of Dutch firms in Poland, greater emphasis was put on the changes in transport flows (volumes and directions related to The Netherlands) caused by the firm's relocation to Poland. The structured interviews generated a wealth of relevant information: partly quantitative, partly qualitative. The main results will now be discussed in the next subsections where we will address two issues, in particular: company structure and current transportation patterns. In 1999 an additional telephonic survey was held to investigate the opportunities of combined transport and of terminal operators as intermediaries in the logistic chains.

61 Company structure

Seven of the twelve foreign companies located in The Netherlands, that were investigated in our empirical analysis, turned out to be the European headquarters of these companies. In Poland none of the Dutch firms under consideration were European headquarters, although for six of the seven companies, the Dutch parent company is the European headquarters (Table 5). Furthermore, the network structure of all foreign companies is at least European; however, only two of the Dutch companies in Poland are part of a world-wide company network. This strong participation in European networks is a prerequisite for combined transport.

Table 5—Distribution and features of nomadic firms

Company structure and feature	Foreign companies in The Netherlands	Dutch companies in Poland	
European headquarters	7	0	(6)*
European network	12	7	
world-wide network	12	2	
new company	11	7	
rented premise	8	5	

* In six cases the Dutch parent company is the European headquarters
source: Bruinsma et al., (1997)

It turned out that nearly all the companies are completely new subsidiaries; only one case concerns a take-over of an already existing company. Another common feature is the preference for rented premises. Only some 25 per cent of the firms possess their accommodation and real estate. These companies are either manufacturing companies or transport companies. From our investigation, it appears that more land-extensive companies tend to posses their company real estate. However, land land-intensive companies, which need office buildings , seem to prefer to rent real estate.

Most relocations are apparently the result of an expansion of existing activities abroad. This does not necessarily mean that those activities were discontinued in the country of origin. It is important to mention that the firms made only minor adjustments to accommodate the product to the demands of the new market. Those minor adjustments are mainly a matter of regrouping, repackaging or adding guidelines for use in the correct languages.

A major difference is that foreign firms in The Netherlands have hardly changed their activities, whereas Dutch companies in Poland have increased the range of their activities to a large extent. Foreign companies in The Netherlands apparently have to serve a mature European market, whereas the emerging East-European market in transition offers many unexploited opportunities. The wish of many Dutch companies to have their own Dutch management available to them and working with them in Poland, seems largely instigated by their wish to exploit these new opportunities which might not be judged to be sufficiently and effectively ensured by local managers in the host country.

62 The current use of transport systems

In this section two aspects will be discussed: 1) the perceived importance of the transport infrastructure and accessibility aspects of the interviewed entrepreneurs, and 2) the current transport flows and use of transport infrastructure by international firms. The first aspect was part of the questionnaire which the entrepreneurs filled in before the interview took place. The second aspect stems from the open interviews. Before presenting the results, the small number

of international firms interviewed in this survey should be pointed out . The results, therefore, should be carefully interpreted.

The entrepreneurs had to express the importance of eleven transport infrastructure and accessibility factors on a score chart (1 = very important, 5 = unimportant) for the performance of their company at the moment they entered The Netherlands (American and Japanese companies) or Poland (Dutch companies) and in the present situation. In Table 6, we present the average score and the ranking of the factors.

Table 6 Average scores and ranking of location factors for international firms in The Netherlands and Poland

American and Japanese firms	The Netherlands (n= 12)				Dutch firms	Poland (n = 5)			
	Entrance market		Situation 1997			Entrance market		Situation 1997	
	Score	rank	score	rank		Score	rank	score	Rank
Proximity market	1.5	1	11.4	1	ICT-facilities	1.8	1	1.6	1
Accessibility by road	1.9	2	1.8	2/3	Accessibility by air	2.0	2/3	2.0	2/3
Accessibility by air	2.0	3/4	1.8	2/3	Accessibility by road	2.0	2/3	2.0	2/3
Location Northwest Eur.	2.0	3/4	11.9	4	Proximity suppliers	2.8	4	2.6	5
ICT-facilities	2.6	5	2.4	5	Location Northwest Eur.	3.0	5/6	3.2	7
Accessibility by sea	3.2	6	3.3	9/10	Location East Europe	3.0	5/6	3.4	8/10
Location South Europe	3.3	7	2.7	6	Proximity market	3.2	7	12.2	4
Proximity suppliers	3.3	8	3.3	9/10	Accessibility by rail	3.4	8/10	2.8	6
Location Benelux	3.5	9	13.1	7	Accessibility by sea	3.4	8/10	13.4	8/10
Accessibility by rail	3.9	10	4.0	11	Location Benelux	3.4	8/10	3.4	8/10
Location East Europe	4.0	11	3.2	8	Location South Europe	4.0	11	3.8	11

Source: based on data Bruinsma et al., 1997

For American and Japanese firms, four factors are clearly important for their performance at the moment they entered the Dutch market: proximity to the market, accessibility by road and air, and their north west European location. Since entering the market – in the period 19904995, two new factors have become more important: ICT-facilities and – in particular, the proximity to Southern Europe. Although still low in ranking, also the proximity to the East European market is clearly growing in importance. Considering the opportunities of combined transport, it can be seen as a positive signal that markets located at rather long distances from the Dutch market are becoming increasingly important for the performance of international firms. Combined transport is a particularly competitive factor on longer European distances. However, the main transport modes of combined transport – rail and short sea – are lowly evaluated in terms of the firm performance (unfortunately accessibility by inland waterways was not included in the questionnaire).

For Dutch firms entering the Polish market, the ICT-facilities and the accessibility by road and air seem to be the most important of the eleven listed factors. Since then the proximity to the market, and to a lesser extent, the accessibility by rail , have grown in impact. This might suggest that if rail is used, opportunities for combined transport may be available. However, the relative importance of proximity to both markets and suppliers suggests short distance freight flows, where it is hard to compete for combined transport.

Regarding the transport flows and the use of transport systems, both surveys point in the same direction. Intercontinental freight transport flows are conducted either by sea or by air. The distribution within Europe takes place by uni-modal transport, in particular road transport - except for special deliveries, high value products, and/or spare materials that are often transported by air. According to our surveys, rail infrastructure seems to be of marginal importance as a uni-modal transport solution. However, one should firstly remember that none of the companies surveyed generate large flows of low-value bulk products. For such products, rail and inland waterway infrastructures are often used. In addition, probably none of the surveyed companies have looked into the option of rail transportation, or inland waterways, in a

combined transport solution. In the next subsection, we will confront a number of the interviewed firms with solutions for their logistics chains.

There are a number of differences between foreign companies located in The Netherlands and Dutch companies located in Poland. Whereas American and Japanese firms in The Netherlands generate largely their own activities and trade flows, Dutch companies in Poland are strongly linked to and dependent on their Dutch parent company. American and Japanese companies appear to develop their own trade flows for independent producers outside of their network structure. The Dutch companies in Poland however, are dependent on the flow of goods which are generated and directed by the parent company. Dutch parent companies appear to collect almost all input and components and then distribute those goods to their subsidiary firms in Poland. This spatial pattern of collection and distribution by the parent company can partially be explained by the explicit company policy to keep stocks in Poland low, in particular since taxes and customs duties must be paid immediately at the Polish border.

Another important difference between American and Japanese companies in The Netherlands and Dutch companies in Poland is that the first class area market comprises all of Europe, whereas the market area of the latter lies mainly within Poland and its East-European neighbour countries. Only in the long-term do Dutch companies in Poland intend to expand their activities by opening new subsidiary firms in, for instance, Russia.

In general, obviously it may be difficult to attract and maintain internationally operating firms in The Netherlands, since the market area exceeds the small size area of The Netherlands by far. The large consumer markets for those internationally operating firms are predominantly Germany, France and the United Kingdom. However, a number of companies stated that from a strategic point of view, it is advantageous to be located in a relatively small consumer market in Europe. None of the large consumer markets can claim that the company is competitively located in their home markets; and even more importantly, none of the large consumer markets can complain that the company is located in another large consumer market instead of their own home-market. Thus, from a strategic competitive viewpoint, a small country may also have advantages for an international operating firm.

From the current use of transport modes and the opportunities for combined transport, we must conclude that international firms are orientated towards uni-modal transportation solutions within Europe. In general, regular deliveries are dealt with by road transport and special deliveries while high value goods and spare parts are transported by air. As for American and Japanese firms in The Netherlands, it appears that long distance markets (South and East Europe) become of increasing importance. The challenge for combined transport is the fact that these markets can be served by combined transport using rail, inland waterways and/or short sea shipping as the main transport mode in the logistics chain. As for the Dutch firms in Poland, the challenge is to become the main agent in transport services between the parent company in The Netherlands and the Polish subsidiary company. The dependency of the subsidiary company is still strong and most flows of goods are organised by the parent company. Here rail, and perhaps short sea shipping, have the best opportunities to become the main transport mode in the combined transport chain.

In later interviews, we tested the above mentioned opportunities of combined transport by measuring the willingness and conditions of the entrepreneurs to shift from uni-modal (mainly road transport) to combined transportation solutions. Furthermore, we tested the willingness and conditions of the entrepreneurs to out source the logistics chain towards intermediaries, in particular terminal operators.

6.3 The opportunities of combined transport

In addition to the 1997 survey, in 1999 we held a second survey among the eleven companies (9 distribution and 2 production) which generate transport or organise trans-European freight

flows that might be served by combined transport. The interviews commenced with the question whether the current used unimodal road transport was a dedicated choice or coincidence. This proved that for all companies, the currently used road transport was a dedicated choice. Subsequently, we asked the entrepreneurs if they ever had considered combined transport as a solution for their logistics chain. Most of the companies answered that they had not considered combined transport as an option when deciding on their transport mode. In cases where they had considered a combined transport solution we asked why they chose not to use it. It appeared that combined transport was not selected because the costs were too high or it was perceived as too time-consuming.

Then we listed the advantages and disadvantages of combined transport - as shown in section 4 - and asked the companies to mention the most important factors as pros and cons of combined transport. The two main arguments in favour of combined transport were: "the international firm may achieve an environmental friendly image" and "the increasing congestion on European roads can be bypassed". The fact that storage of goods may take place in the transportation phases (in containers) leading to lower safety stocks was not supported, probably because of the higher risks of combined transport (e.g. lower reliability and more freight damage).

The two main disadvantages that were mentioned are: "the management (e.g. many actors) of combined transport solutions usually complicates daily operations" and "combined transport is more time-consuming than uni-modal road transport".

Next, we listed the additional advantages of internalising versus outsourcing the logistics chain in a combined transport solution and asked them to mention the most important factors pro and contra internalising and outsourcing. Companies which internalise logistics consider more control to be an advantage, whereas companies which outsource logistics do not see this as an advantage. The less broader view on transport networks that an international firm is capable of, is viewed as a disadvantage. Advantages of outsourcing were "the international firm can concentrate on its core business", "decrease in logistics costs because of better knowledge of the combined transport company" and "opportunities to specialise for both international firms and combined transport operators". Less control is generally not perceived as a disadvantage.

Finally, we asked them to reconsider their decision and give their judgement about the opportunities of combined transport for their European freight flows given all the information they had received. None of the companies were interested in using combined transport after the short survey. We asked them to mention the main arguments on which their final decision was based. The main arguments not to support the use of combined transport were about higher costs, lower time performance, small volumes, and less reliability. Even if combined transport improves in terms of the above-mentioned factors, it will take time to achieve a high level of acceptance by entrepreneurs. After the quality of combined transport actually has improved, it will still take a lot of work to improve the image of combined transport. Reading between the lines, one senses a kind of natural resistance to the unknown by entrepreneurs considering combined transport as an alternative for international transport flows.

7. Conclusion

In this article, we explore the mutual relationship between international operating firms and combined transport. In the empirical work, the emphasis is on the opportunities that combined transport may offer international operating firms in finding a solution for their logistics chain. Taking this a step further, the question arises whether an international operating firm would further benefit by outsourcing the logistics chain towards an independent intermediary, for instance an intermodal freight operator? Given this one-sided perspective, additional research - with emphasis on the advantages for combined transport stakeholders - is called for. However, from our reconnoitring survey, we are able to draw some preliminary conclusions. Firstly, all

companies declare that the currently used unimodal road transport is a dedicated choice. However, most of the companies did not consider combined transport as an option when they made the decision to choose unimodal road transport. Moreover, an environmental friendly image and bypassing road congestion are seen as advantages when using combined transport. Perceived disadvantages are higher costs, longer transport time, less reliability, and freight volumes that are considered to be too low. Internalising or outsourcing the logistics channel appears to be more of a preference than a dedicated choice. This preference is guided by control attitude, knowledge of transport networks within the international firm, degree of concentration on core-business, and degree of specialisation. Finally, none of the companies are interested in using combined transport after evaluating the advantages and disadvantages of combined transport as mentioned in the survey. In our opinion, combined transport still has to tackle the negative image which is partly based on subjective judgements by entrepreneurs (the natural resistance against the unknown). However, our sample was small and more thorough research is required to sketch the full potential of combined transport for European international freight flows.

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